United States Patent [19]

Kovaleski

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[45] **Feb. 20, 1973**

[54] **TAKE-APART SPOOL FOR WIRE AND THE LIKE**

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[52] **U.S. Cl.** **242/115,** 242/118.61, 242/125.1

[51] **Int. Cl.** **B65h 75/22,** B65h 75/28, B65h 75/14

[58] **Field of Search**..242/118.6, 118.8, 118.7, 118.4, 242/118.61, 118, 77.3, 77.4, 77, 115, 125.1, 125

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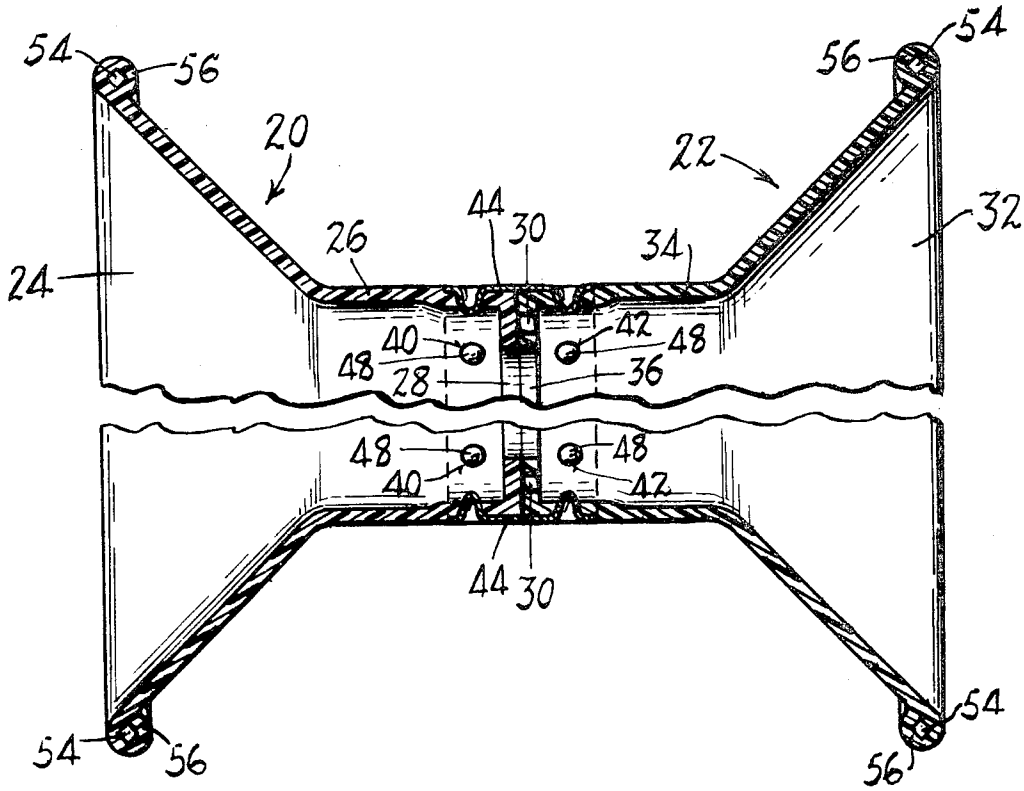
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[57] **ABSTRACT**

A spool for wire and like products, comprising a generally cylindrical body portion so arranged that the spool separates into two substantially identical halves along a transverse plane which is perpendicular to the spool axis and is located preferably substantially intermediate the ends of the body portion. The joining or engaging parts of the body portion are keyed to each other against turning and are prevented from separation by novel means arranged so that the securement or clamping action thereof is enhanced by the force exerted by the wire or similar material which is wound on the spool. In the main embodiment of the invention the body halves have quarter-segment splined portions and quarter-segment keyways receiving the spline portions, all said spline portions having circumferential clamping grooves which become aligned to constitute a single annular groove which is completely filled by the beginning turns of the wire which is wound on the body portion. The beginning turns thus lock the body portions to each other.

10 Claims, 17 Drawing Figures



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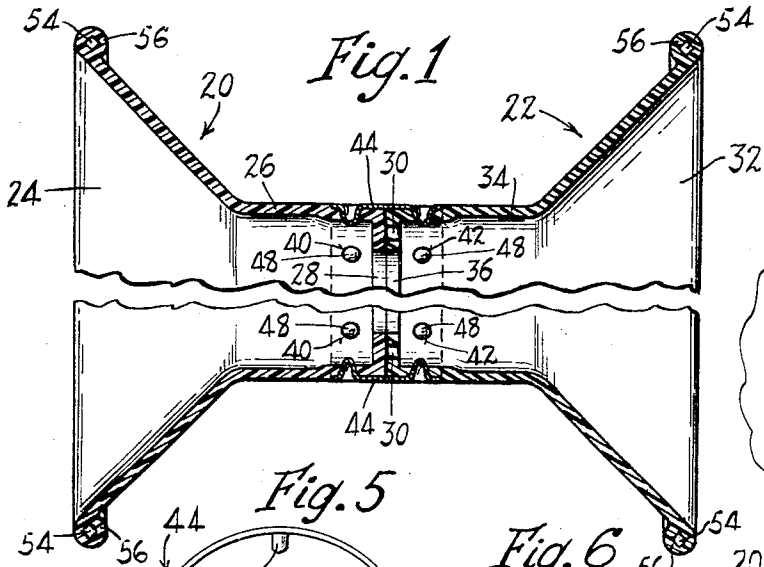


Fig. 1

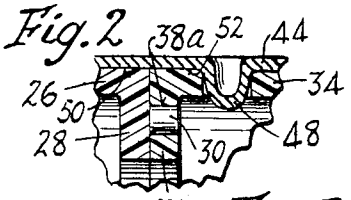


Fig. 2

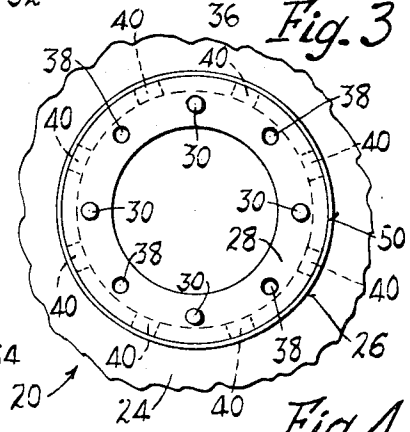


Fig. 3

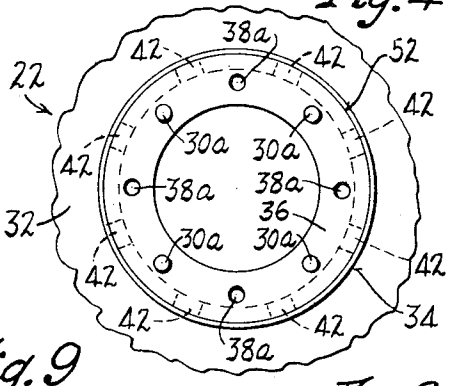


Fig. 4

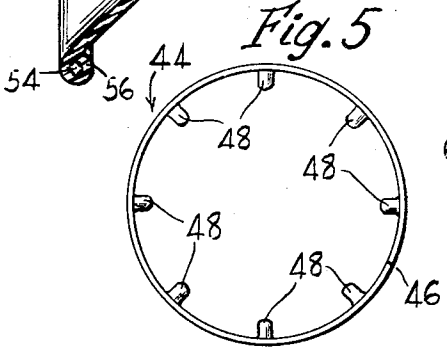


Fig. 5

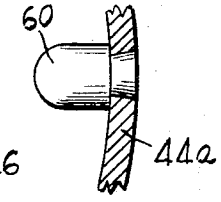


Fig. 6

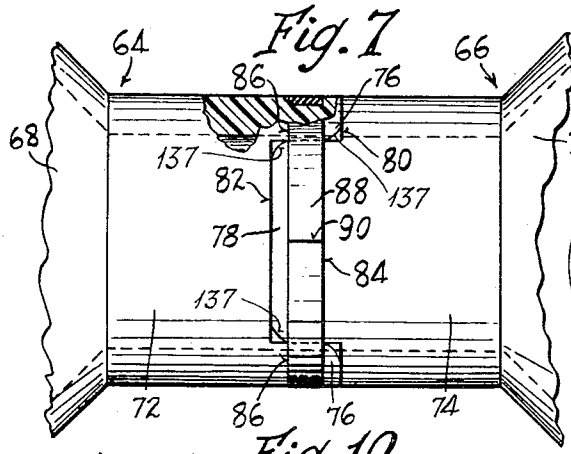


Fig. 7

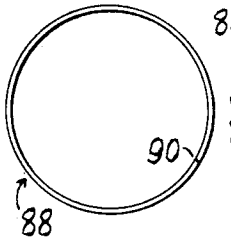


Fig. 9

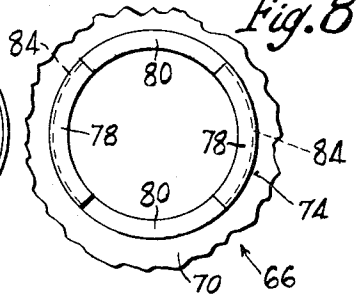


Fig. 8

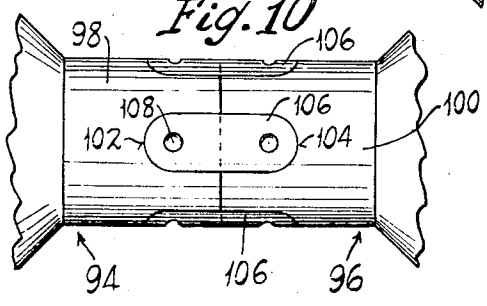


Fig. 10

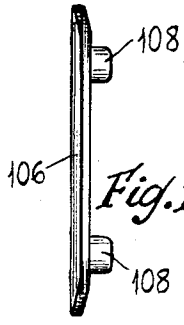


Fig. 11



Fig. 12

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Fig. 13

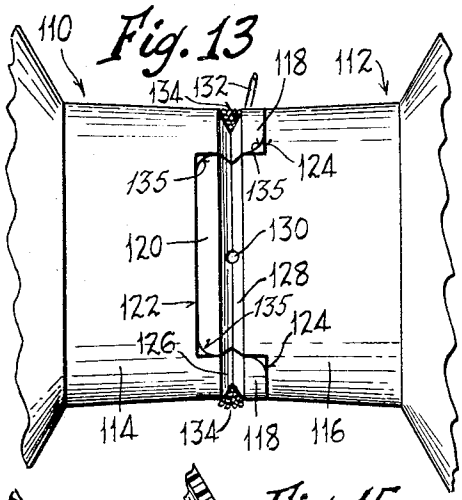


Fig. 14

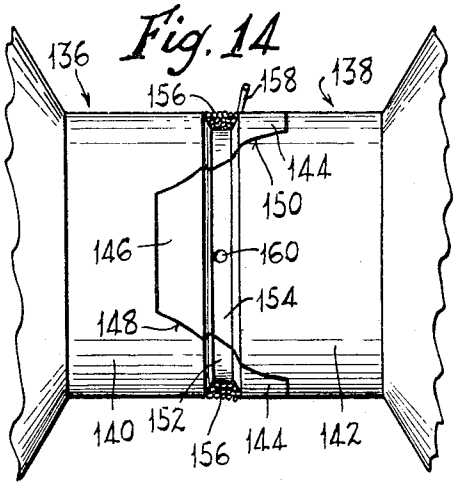


Fig. 15

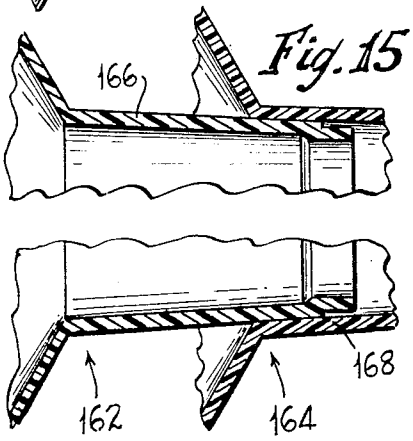


Fig. 16

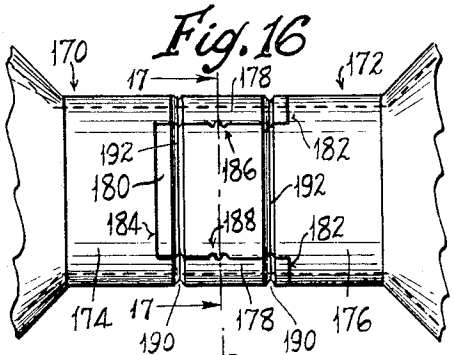
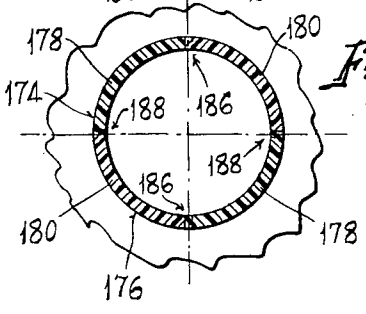


Fig. 17



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TAKE-APART SPOOL FOR WIRE AND THE LIKE

BACKGROUND

This invention relates to spools for wire and the like, comprising essentially cylindrical body portions and straight or tapered flanges, and more particularly to spools of this type as constituted in various sizes, wherein a separation of the two spool halves can occur at some intermediate point in the cylindrical body portion, enabling the spools to be more readily molded as halves or half portions, and also to be more readily stacked or stored.

Heretofore, spools of this type have been proposed where the halves were made separately and thereafter joined, each half comprising a generally cylindrical body portion and an end flange. The body portions where they met and joined, were formed with transverse walls or else inwardly extending annular flanges, which were brought into engagement and either welded together, riveted together, or else secured by studs provided on one half, passing through apertures in the other half and carrying sheet metal clips or nuts. Other constructions involved folded-over edges provided on one internal flange and laid over another flange having an annular configuration. Generally such prior spools, once the halves were secured together, were not intended to be disassembled or dismantled and reused later by reassembling them. In cases where the spool halves were intended to be separated and joined for later use, the attaching means tended to be costly and time-consuming in operation, and often susceptible of failure, particularly under the stress of the wire with which the spool was filled.

SUMMARY

The above drawbacks and disadvantages of prior composite spools intended to carry wire and the like are obviated by the present invention which has for one of its objects the provision of a novel and improved composite or multi-part spool for wire and the like, wherein the spool parts can be readily disassembled and later reassembled for subsequent use, the fastening means for said parts being so constituted that the winding of wire or the like on the spool strengthens the fastening means and the securement of the spool parts to each other rather than weakens the fastening means, which then tends to permit breaking apart of the spool halves. This is accomplished, in one embodiment of the invention, by the provision of a novel split clamp ring having inwardly extending studs which are received in clamp apertures of adjoining portions of the cylindrical body parts, the clamp ring being recessed so as to be flush with the body parts and being adapted to have wire wound about it as the initial winding process progresses on the spool body. Thus the pressure or force exerted by the wire on the clamp ring maintains it more securely in place and prevents any possibility of the ring working loose, or the studs thereof. In another embodiment of the invention the clamp ring is replaced by recessed curvilinear connector strips having studs which are received in clamp apertures of the body portions of the spool halves. The wire being wound around the body portions also winds around or over the connector strips and holds the latter securely in position whereby their displacement is not possible. In still another embodiment of the invention the adjoining

portions of the cylindrical spool bodies are provided with quarter-segment spline portions which are formed with circumferential grooves that become aligned as the spool halves are assembled. A split clamp ring is then applied to the resultant annular groove and fits flush therein. The wire being wound on the cylindrical body portions of the spool covers the split clamp ring and prevents any displacement of the latter whereby the spool halves cannot be separated while carrying wire, but only after final use or removal of the wire. In still other embodiments of the invention, the split clamp ring which occupies the aligned grooves of the quarter-segment spline portions are dispensed with, and the wire itself as it is wound on the spool body occupies the resultant circumferential groove or grooves, constituting in effect a strand-type clamp device which securely locks the body portions of the spool together and prevents any separation as long as any wire occupies the clamping groove. The body portions of the spool halves may be made slightly tapered or provided with a draft angle whereby the small part of one body portion can partially fit within the larger part of another body portion, thereby enabling the spool halves to be partially nested so as to conserve storage space.

Still other features and objects of the invention reside in the provision of an improved take-apart spool for wire and the like as above set forth, wherein the spool halves can be readily economically molded with conventional mold and die equipment, wherein the spool halves are especially simple in construction and rugged and durable in use so that they can withstand extremely powerful stresses and abuse without failure.

A still further object of the invention is to provide an improved take-apart spool as above characterized, wherein the halves are constituted of fiberglass and polyester resin, with reinforced wire insert rims, thereby to provide the utmost in strength, impact resistance, and resistance to failure under continued severe useage.

Still other features and advantages will hereinafter appear.

In the accompanying drawings, illustrating several embodiments of the invention:

FIG. 1 is a fragmentary axial sectional view of a molded-plastic, composite or take-apart spool for wire and the like as provided by the invention and having a split clamp ring for securing together the two spool halves.

FIG. 2 is a fragmentary enlarged sectional view through a portion of the keying and clamping means located at the center of the cylindrical spool body.

FIG. 3 is a fragmentary inside end elevational view of one of the two spool halves of FIG. 1.

FIG. 4 is a fragmentary inside end elevational view of the other of the two spool halves of FIG. 1.

FIG. 5 is a side elevational view of the split clamp ring provided in the spool of FIGS. 1–4.

FIG. 6 is a fragmentary sectional view of a split clamp ring illustrating a modified form of the invention.

FIG. 7 is a fragmentary view partly in side elevation and partly in axial section of a molded-plastic composite or take-apart spool constituting another embodiment of the invention wherein the clamping means comprises a smooth split ring and interfitting quarter-segment spline and keyway portions.

FIG. 8 is a fragmentary inside end elevational view of one of the two spool halves of the spool of FIG. 7.

FIG. 9 is a side elevational view of the split clamp ring as utilized with the spool of FIGS. 7 and 8.

FIG. 10 is a fragmentary side elevational view of a composite spool constituting yet another embodiment of the invention, wherein curvilinear strips are employed to secure together the two spool halves instead of a split clamp ring.

FIG. 11 is a side elevational view, enlarged, of one of the curvilinear strips as employed with the spool of FIG. 10.

FIG. 12 is a fragmentary side elevational view showing a portion of a twisted, square cross section wire ring insert as provided in the rounded edges or beads of the end flanges of the spool of FIG. 1.

FIG. 13 illustrates another embodiment of the invention, comprising a fragmentary side elevational view of a multi-part molded plastic spool wherein the clamping means comprises the wound wire itself, as it is being applied to the cylindrical spool body.

FIG. 14 is a fragmentary side elevational view of a multi-part spool constituting yet another embodiment of the invention, wherein the spool halves have interengaging quarter-segment spline portions and wherein a greater amount of the wire being wound on the spool constitutes the clamping means thereof.

FIG. 15 is a fragmentary axial sectional view of two spool halves which are partially nested after being disassembled.

FIG. 16 is a fragmentary side elevational view of a composite molded-plastic spool construction constituting yet another embodiment of the invention wherein the spool halves have slightly resilient and yieldable quarter-segment spline portions the edges of which have interfitting transverse ribs and grooves to constitute a detent action. The spline portions are also provided with circumferential clamping grooves, adapted to receive the initial turns of wire which are being wound around the spool, for the purpose of securing the spool halves to each other against separation.

FIG. 17 is a transverse section taken on the line 17—17 of FIG. 16.

Considering first FIGS. 1–5, the improved composite molded-plastic spool illustrated therein comprises two halves 20, 22 shown as having angular or flared end flanges and substantially cylindrical body portions. The spool half 20 comprises a conical end flange 24 and a substantially cylindrical body portion 26, the latter being provided at its end remote from the flange 24 with an internal planar end flange 28 having a plurality of keying pins 30 and keying apertures 38.

The spool half 22 comprises a conical end flange 32 and a substantially cylindrical body portion 34, the latter at its end remote from the flange 32 being provided with a planar internal annular end flange 36 having a plurality of keying pins 30*a* and keying apertures 38*a* adapted to respectively cooperate with or receive the keying apertures 38 and keying pins 30 of the spool half 20. Accordingly, the spool halves 20, 22 may be secured to each other in keyed coaxial relationship when the keying pins 30, 30*a* are inserted in the keying apertures 38, 38*a* respectively.

In accordaNce with the present invention, the spool halves 20, 22 are secured to each other in a positive and very secure manner, such that the winding of wire on the assembled spool halves tends to more securely retain the halves in assembled relation and to maintain and strengthen the securing or connector means. As shown, the body portions 26, 34 of the spool halves are provided each with a plurality of clamp apertures 40, 42 respectively, and a split clamp ring 44 is provided, having a through cut 46 in its periphery, and having a plurality of pairs of hollow embossed studs 48 adapted to be received respectively in the series of clamp apertures 40, 42 of the spool halves. In effecting such assemblage, the split clamp ring 44 may be opened-up slightly and disposed on one of the cylindrical body portions 26, 34 prior to assemblage of the spool halves to each other utilizing the keying pins 30, 30*a* in the keying apertures 38, 38*a*. Thereafter, the split clamp ring 44 may be slid along the body portion to bring the embossed studs 48 into alignment with the clamp apertures 40, 42 to be received therein in the manner illustrated in FIGS. 1 and 2. It will now be seen that the spool halves 20, 22 are not only keyed to each other in coaxial relationship and against relative turning, but are also securely fastened together against separation axially. As the wire is wound on the cylindrical body portions 26, 34 it will cover the clamp ring 44 and maintain the studs 48 thereof securely in the clamp apertures 40, 42 of the body portions.

The body portions 26, 34 are recessed or reduced in diameter slightly to provide smaller-diameter cylindrical surfaces 50, 52 as seen in FIG. 2, whereby the split clamp ring 44 can be made to fit flush with the remainder of the body portions 26, 34. The amount of recessing to effect the smaller diameter surfaces 50, 52 is equal to the thickness of the stock from which the clamp ring 44 is formed, preferably.

The spool halves 20, 22 are preferably constituted of molded plastic comprising fiberglass and polyester resin, being formed in suitable molds and in accordance with the invention being provided with continuous ring inserts 54 of wire, in retainer bead portions 56 at the large peripheries of the end flanges 24, 32. The wire ring inserts 54 are constituted of wire of square cross section, such wire being twisted as illustrated in FIG. 12 whereby an interlocking of the wire and the surrounding plastic is had, with consequent increased strength. The wire ring inserts 54 are preferably of steel, and may be hardened to provide increased strength to the peripheral bead portions of the spool halves.

The split clamp ring 44 illustrated in FIGS. 1, 2 and 5 is shown as having studs 48 provided by an embossing or stamping procedure. In place of such embossed hollow studs, solid studs 60 may be provided, being shown in a clamp ring 44*a* as illustrated in FIG. 6.

It will now be seen that the winding of wire on the spool comprising the halves 20, 22 results in the wire securely holding in place the split clamp ring 44 whereby the studs 48 thereof cannot shift out of the clamp apertures 40, 42 of the spool body portions. Accordingly, the placement of the wire on the spool results in an increased security against separation of the spool halves.

Another embodiment of the invention, having the characteristic of increased security against separation as a consequence of wire being wound on the spool body portion, is illustrated in FIGS. 7, 8 and 9. In these

figures there are shown spool halves 64, 66 comprising respectively end flanges 68, 70 and substantially cylindrical body portions 72, 74. The body portions 72, 74 are respectively provided with quarter-segment spline portions 76, 78 which interfit, being received in quarter-segment keyways 80, 82 respectively. Additionally, the spline portions 78 have circumferential, relatively wide and shallow grooves 84, and the spline portions 76 have similar circumferential grooves 86. The grooves 84, 86 become aligned with each other when the body portions 72, 74 are assembled, as illustrated in FIG. 7, thereby forming one continuous annular circumferential groove. Received in such continuous circumferential groove is a split smooth clamp ring 88 having a through cut 90 as illustrated in FIG. 9. The clamp ring 88 fits flush with the remaining surfaces of the cylindrical body portions 72, 74, and by interlocking with the spline portions thereof provides a retainer which prevents separation of the spool halves. Moreover, as wire is wound on the body portions 72,74 it will cover the smooth split clamp ring 88 and positively hold the latter in place, preventing any displacement whatsoever and securely retaining the spool halves 64, 66 in assembled relation.

Still another embodiment of the invention is illustrated in FIGS. 10 and 11. In these figures, two spool halves 94, 96 have body portions 98, 100 provided with recesses 102, 104 in which are received curvilinear connector strips 106. The connector strips 106 have hollow embossed studs 108 which are received in cooperable clamp apertures in the body portions 98, 100. The connector strips 106 fit flush with the remaining surfaces of the body portions 98, 100, and when wire is wound on the body portions such turns of wire will securely retain the connector strips 106 in their proper positions as illustrated in FIG. 10, positively preventing separation of the spool halves 94, 96.

Yet another embodiment of the invention is illustrated in FIG. 13, wherein two spool halves 110, 112 have body portions 114, 116 which are slightly tapered, said body portions having respectively quarter-segment spline portions 118, 120 which interfit and are received respectively in quarter-section keyways 122, 124. The spline portions 118, 120 have circumferentially extending clamping V-grooves 126, 128 which become aligned when the spool halves are assembled as shown in FIG. 13, so as to form a single angular V-groove. The spline portion 120 is illustrated as having a wire-starting hole 130 to receive the starting end of the wire which the spool is to receive. After the starting wire end has been inserted in the hole 130, the wire is wound so as to fill the clamping grooves 126, 128 as illustrated, after which the winding of the wire 132 is continued on the remainder of the body portions 114, 116. The initial starting turns of the wire 132 constitute a bundle 134 of strands, said bundle of strands comprising the clamp ring, so to speak, which secures the spool halves 110, 112 against separation. Since the bundle 134 of wires is tightly wound in the V-grooves 126, 128, a secure locking of the two spool halves will be effected.

In place of the starting hole 130, the spline portions 118, 120 can be formed with rounded corners or radii 135, by which small triangular shaped clearance spaces exist at the inside corners adjoining these radii. These clearance spaces are large enough to accommodate the starting end of the wire. In the same manner, the spline portions 76, 78 shown in FIG. 7 can have rounded corners or radii 137 to form corner clearance spaces for starting the wire. The band 88 can be dispensed with and replaced by starting turns of the wire, as seen for example in FIG. 14 now to be described.

Another embodiment of the invention is illustrated in FIG. 14, wherein spool halves 136, 138 have body portions 140, 142 provided with quarter-segment tapered spline portions 144, 146. The body portions 140, 142 also have quarter-section tapered keyways 148, 150 to respectively receive the tapered spline portions 144, 146.

The spline portions 144, 146 have flat-bottom, circumferentially extending grooves 152, 154 with tapered side edges or shoulders, said grooves becoming aligned and constituting a single circumferential locking groove which is then filled with a starting bundle of wire strands designated 156. The wire 158 leading from the bundle of strands 156 is continued or has its winding continued on the body portions 140, 142. A starting hole 160 is provided for the beginning end of the wire 158.

In FIG. 15 spool halves 162, 164 are provided with slightly tapered body portions 166, 168 respectively, which in addition to providing a desirable draft angle for facilitating withdrawal of the spool halves from the molds, enables the one spool half 162 to be partially nested in the other spool half 164 when the halves are disassembled from each other.

Yet another embodiment of the invention is illustrated in FIG. 16, wherein spool halves 170, 172 have body portions 174, 176 provided with resilient and slightly yieldable quarter-segment spline portions 178, 180 respectively. The spline portions are received in quarter-segment keyways 182, 184 as illustrated, and said spline portions have interfitting and interengaging transverse sets of ribs and grooves 186, 188 in their edges.

The spline portions 178, 180 also have V-grooves 190, 192 which become aligned and form a set of two complete annular clamping grooves as illustrated in FIG. 16 for the purpose of receiving the initial turns of wire which are wound on the body portions 174, 176. Such initial turns of wire constitute a clamping means in the grooves 190, 192 and in addition tend to force more tightly into engagement with each other the ribs and grooves 186, 188 in the edges of the spline portions. As a consequence, a very secure attachment of the spool halves 170, 172 is effected to each other.

It will now be understood from the foregoing that I have provided a novel and improved molded-plastic composite spool construction wherein the securing means may be constituted either of the wire being wound on the spool body or else of connecting or clamping members, in each case the winding of the wire effecting a more secure attachment of the spool halves to each other. The spool constructions illustrated are seen to be especially simple, easily and economically molded in conventional molds, and easily assembled and wound with wire by the ultimate customer or consumer. Moreover, the spool halves may be disassembled after the wire has been removed, and may be then again assembled at a later time for re-

peated use. The spool halves may be nested when disassembled, and the construction is so arranged that the winding of the wire tends to attach the spool halves to each other more securely due to the force exerted by the wire on the spool body and any clamping means thereof. The reinforcement of the peripheral bead portions of the spool flanges by means of the twisted wire ring inserts provides added strength and durability, and the use of fiberglass and polyester resins results in a spool construction which is especially sturdy, resistant to shock and severe usage.

Variations and modifications are possible without departing from the spirit of the invention.

I claim:

1. A composite spool construction comprising, in combination:
   a. a pair of substantially cylindrical body portions coaxially disposed in end-to-end relation,
   b. said body portions having adjoining clamp recesses in their outer peripheral surfaces, said recesses having walls facing substantially axially away from each other,
   c. interlocking connector means extending between and disposed in said adjoining clamp recesses and engaged with said recess walls,
   d. said connector means extending along the outer peripheral surfaces of said body portions and being exposed to and engageable by wire which is wound on said body portions whereby the means is subjected to radially inward forces from said wound wire and retained thereby more securely in said clamp recesses so as to effectively retain the body portions against separation.

2. A composite spool construction as defined in claim 1, wherein:
   a. the connector means comprises a clamp ring extending circumferentially around said body portions.

3. A composite spool construction as defined in claim 2, and further including:
   a. cooperable keying projections and keyways on and in the body portions respectively, orienting the portions to each other and preventing relative turning thereof.

4. A composite spool construction as defined in claim 1, wherein:
   a. the clamp recesses have flat bottoms and sloping side walls.

5. a composite spool construction comprising, in combination:
   a. a pair of substantially cylindrical body portions coaxially disposed in end-to-end substantially abutting relation,
   b. said body portions having adjoining clamp recesses in their outer peripheral surfaces,
   c. connector means extending between and disposed in said adjoining clamp recesses,
   d. said connector means extending along the outer peripheral surfaces of said body portions and being exposed to and engageable by wire which is wound on said body portions whereby the means is subjected to radially inward forces from said wound wire and retained thereby more securely in said clamp recesses so as to effectively retain the body portions against separation,
   e. said body portions having cooperable splines and keyways,
   f. said clamp recesses comprising circumferentially extending exterior grooves in said splines, and
   g. said connector means comprising a clamp ring disposed in said grooves.

6. A composite spool construction as defined in claim 5, wherein:
   a. the splines comprise quarter segments of the body portions,
   b. said keyways being in quarter segments of the body portions.

7. A composite spool construction comprising, in combination:
   a. a pair of substantially cylindrical body portions coaxially disposed in end-to-end relation,
   b. each of said body portions having a clamp recess in its outer peripheral surface, at least portions of said recesses of the body portions being adjoining and circumferentially aligned with one another to form substantially constituting circumferential continuations of each other,
   c. interlocking connector means extending between and disposed in said adjoining circumferentially aligned portions of said clamp recesses,
   d. said connector means extending along the outer peripheral surfaces of said body portions and being exposed to and engageable by wire which is wound on said body portions whereby the means is subjected to radially inward forces from said wound wire and retained thereby more securely in said circumferentially aligned portions of said clamp recesses so as to effectively retain the body portions against separation.

8. A composite spool construction comprising, in combination:
   a. a pair of substantially cylindrical body portions coaxially disposed in end-to-end substantially abutting relation,
   b. said body portions having adjoining clamp recesses in their outer peripheral surfaces,
   c. connector means extending between and disposed in said adjoining clamp recesses,
   d. said connector means extending along the outer peripheral surfaces of said body portions and being exposed to and engageable by wire which is wound on said body portions whereby the means is subjected to radially inward forces from said wound wire and retained thereby more securely in said clamp recesses so as to effectively retain the body portions against separation,
   e. said connector means comprising axially extending curvilinear strips having studs disposed in the clamp recesses of the body portions.

9. A composite spool construction comprising, in combination:
   a. a pair of substantially cylindrical body portions coaxially disposed in end-to-end substantially abutting relation,
   b. said body portions having adjoining clamp recesses in their outer peripheral surfaces,
   c. connector means extending between and disposed in said adjoining clamp recesses,
   d. said connector means extending along the outer peripheral surfaces of said body portions and being

exposed to and engageable by wire which is wound on said body portions whereby the means is subjected to radially inward forces from said wound wire and retained thereby more securely in said clamp recesses so as to effectively retain the body portions against separation,

e. said connector means comprising a bundle of wires.

10. A composite spool construction comprising, in combination:

a. a pair of substantially cylindrical body portions coaxially disposed in end-to-end substantially abutting relation,

b. said body portions having adjoining clamp recesses in their outer peripheral surfaces,

c. connector means extending between and disposed in said adjoining clamp recesses,

d. said connector means extending along the outer peripheral surfaces of said body portions and being exposed to and engageable by wire which is wound on said body portions whereby the means is subjected to radially inward forces from said wound wire and retained thereby more securely in said clamp recesses so as to effectively retain the body portions against separation,

e. said body portions having cooperable splines and keyways,

f. said clamp recesses comprising circumferentially extending exterior grooves in said splines, and

g. said splines having rounded corners which leave clearance spaces in the keyways, to accommodate the starting end of wire to be wound on the spool.

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